# United States Patent [19]

**Forrest**

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[54] **VENTED ROOF CONSTRUCTION**


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**Related U.S. Application Data**

[63] Continuation-in-part of Ser. No. 494,642, May 16, 1983, abandoned.

[51] **Int. Cl.**[4] ..... **E04B 1/70**

[52] **U.S. Cl.** ..... **52/303;** 98/31

[58] **Field of Search** ..... 52/302, 303, 92, 95, 52/199, 405, 407, 408; 98/31, 32



[56] **References Cited**

U.S. PATENT DOCUMENTS

| | | | |
|---|---|---|---|
| 475,593 | 5/1892 | Millard | 52/407 |
| 2,264,961 | 12/1941 | Ward | 52/303 |
| 2,645,824 | 7/1953 | Titsworth | 52/407 |
| 3,343,474 | 9/1967 | Sohda et al. | 98/31 |
| 3,368,473 | 9/1967 | Sohda et al. | 98/31 |
| 3,797,180 | 3/1974 | Grange | 52/199 |
| 4,015,381 | 4/1977 | Schmidt | 52/199 |
| 4,254,598 | 3/1981 | Rogroden | 52/95 |
| 4,295,415 | 10/1981 | Schneider | 52/303 |
| 4,446,661 | 5/1984 | Jonsson et al. | 52/95 |



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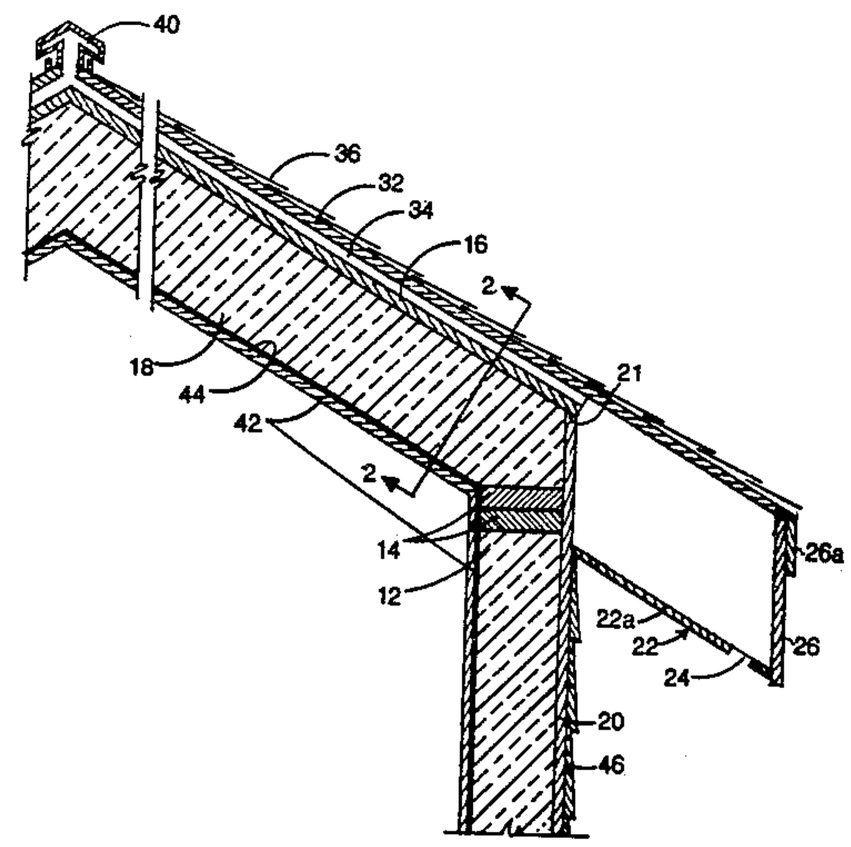
*Attorney, Agent, or Firm*—John W. Adams



[57] **ABSTRACT**

A roof construction provided with a series of vented air circulation passages between the outer roofing layer and an inner sealed insulation layer to provide a positive ventilating system and prevent accumulation of moisture within the insulated inner portion of the roof structure.


**7 Claims, 10 Drawing Figures**



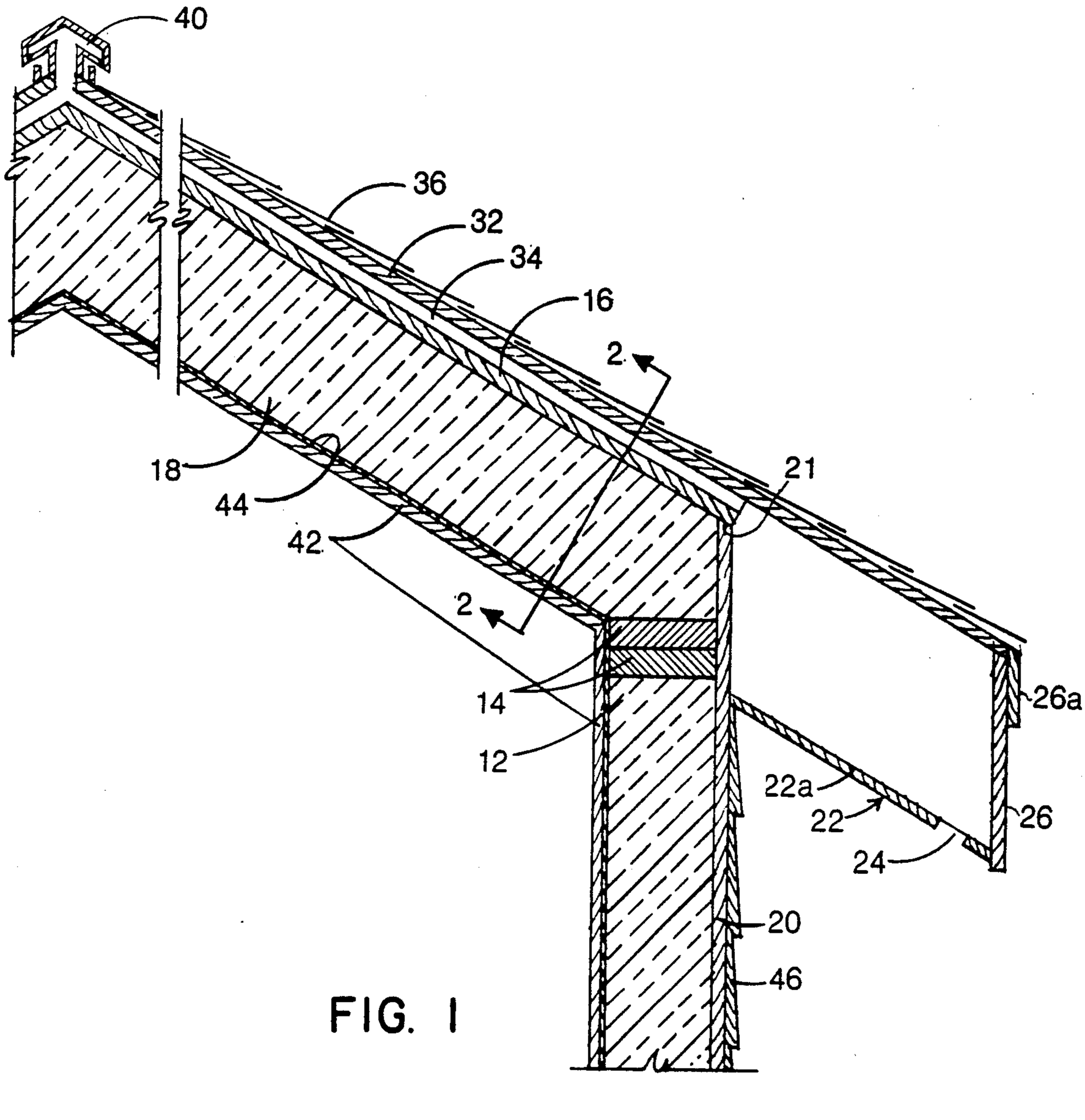

40
36
32
34
16
2
18
44
42
21
2
14
12
26a
22a
22
26
24
20
46

FIG. 1


30
32
16
34
30
10
10

FIG. 2

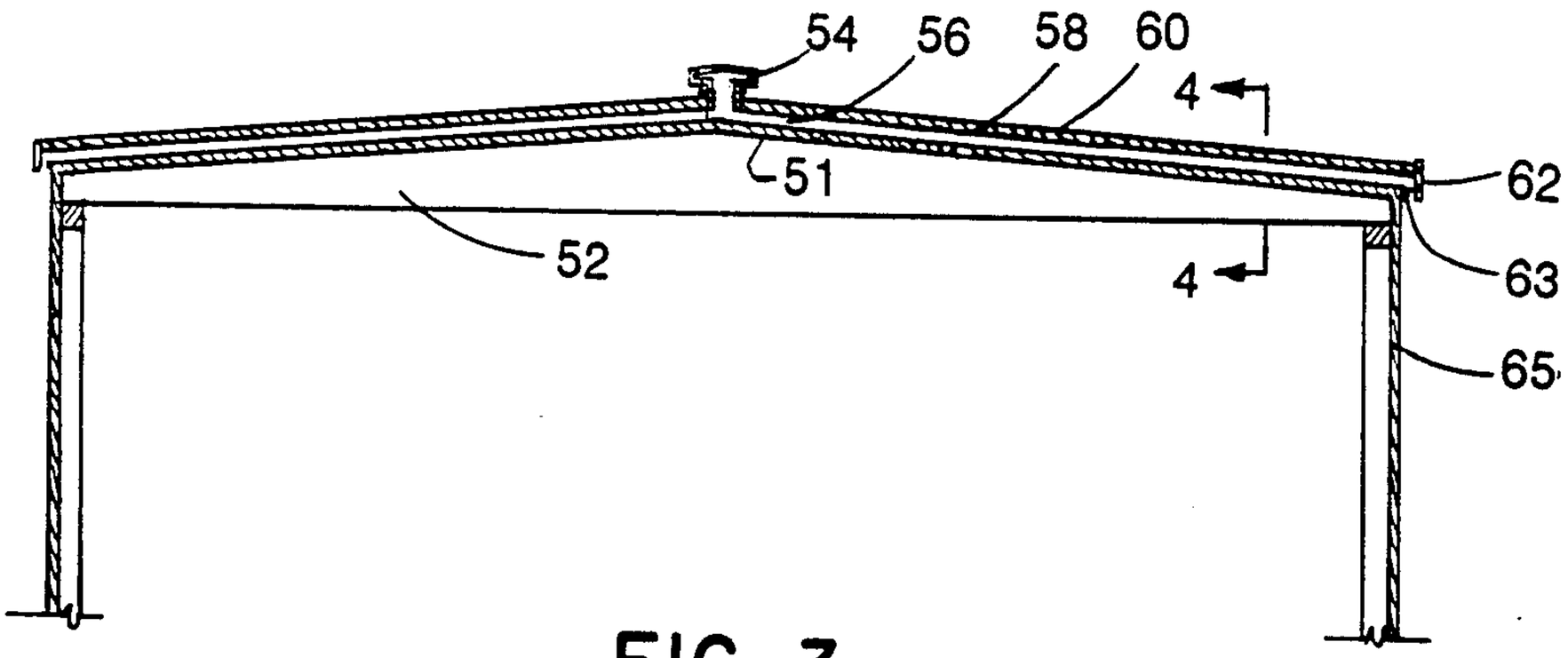



FIG. 3

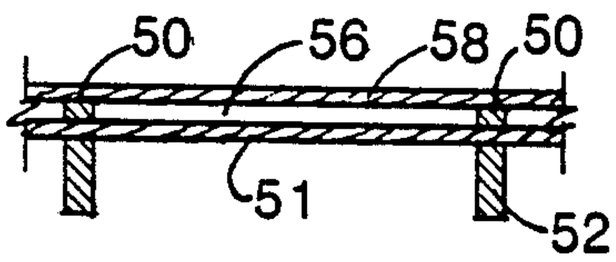



FIG. 4

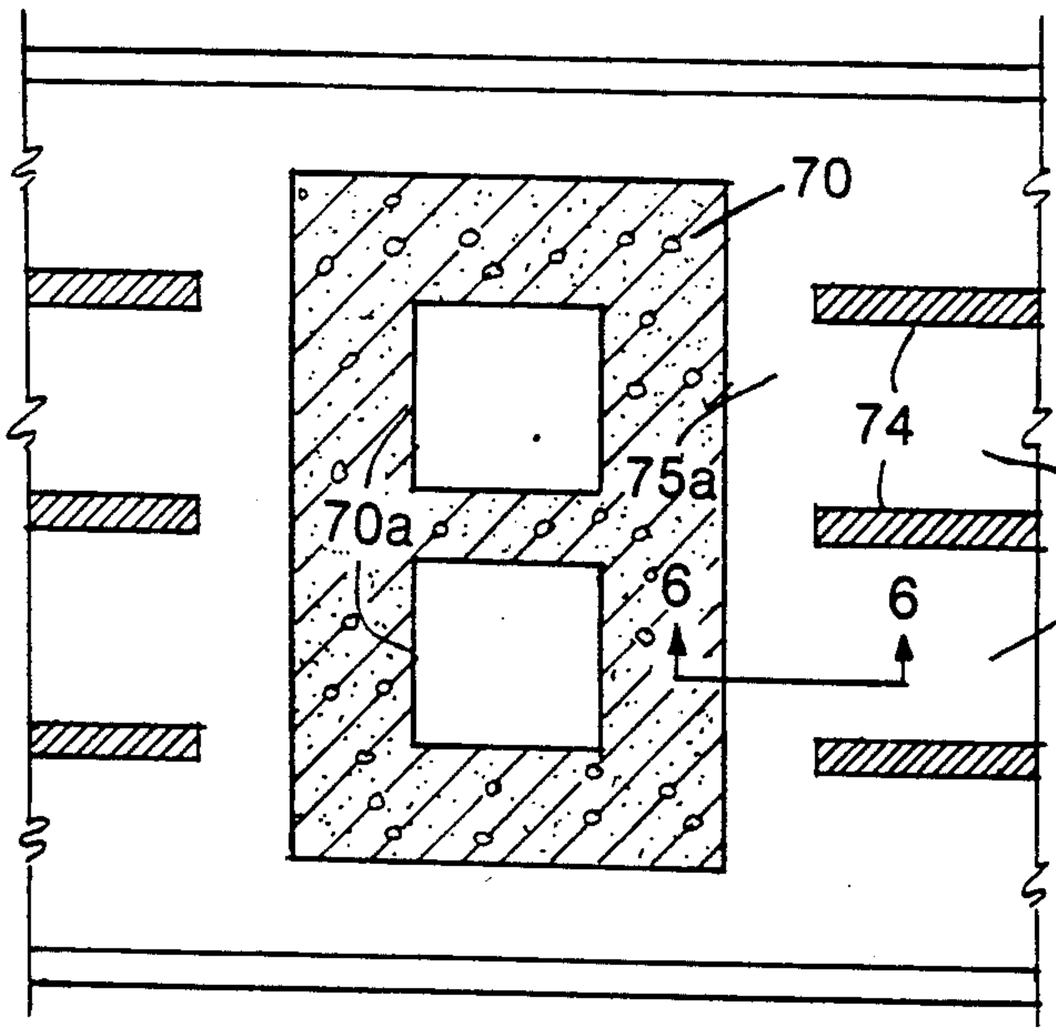



FIG. 5

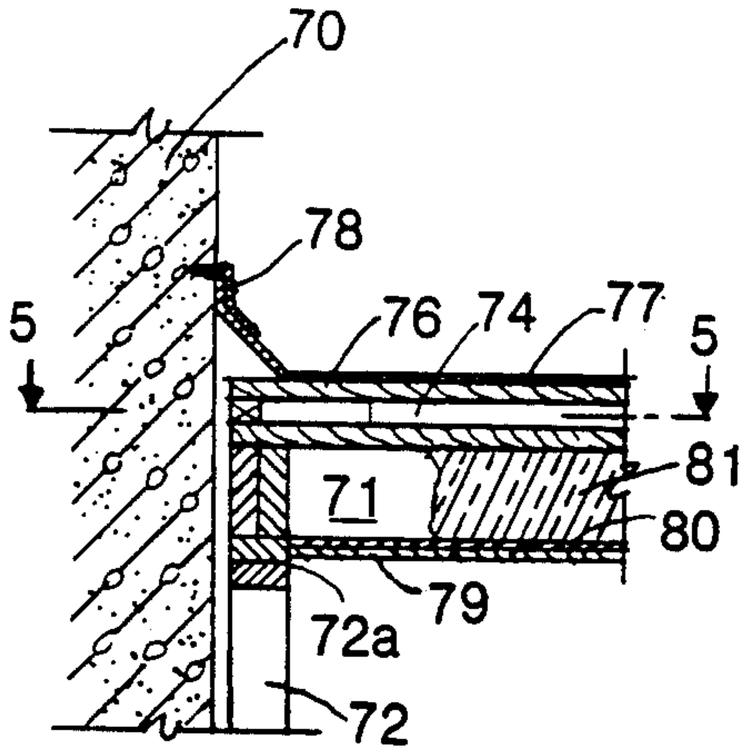



FIG. 6

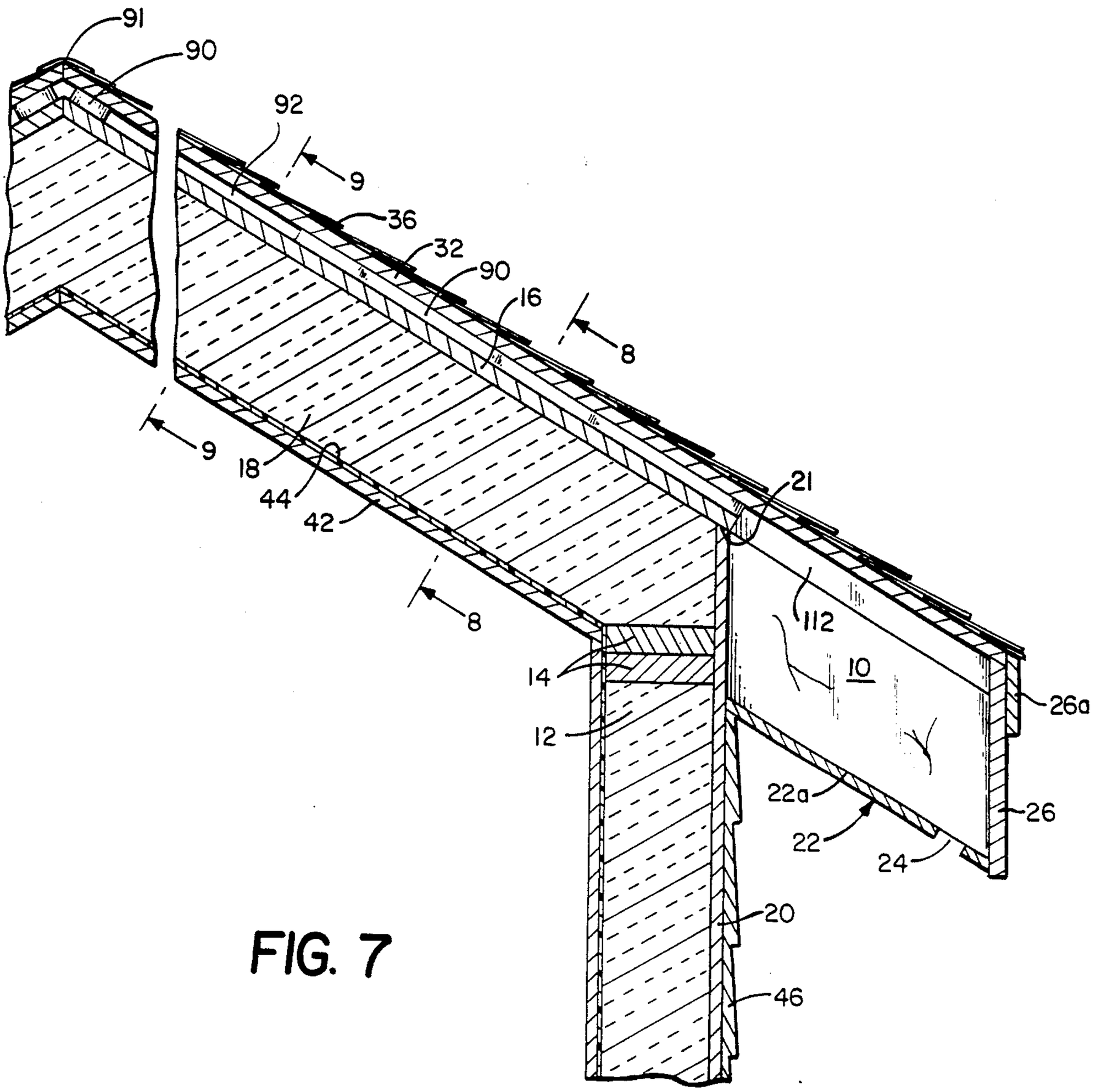



FIG. 7

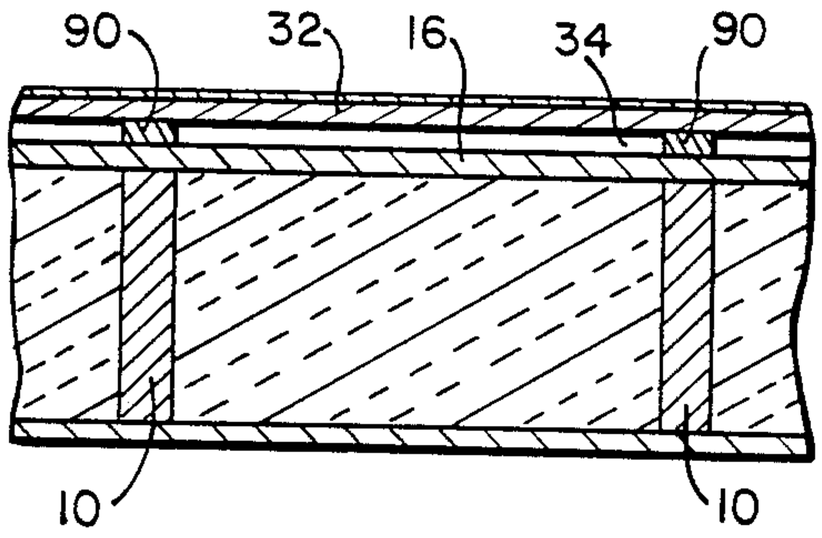



FIG. 8

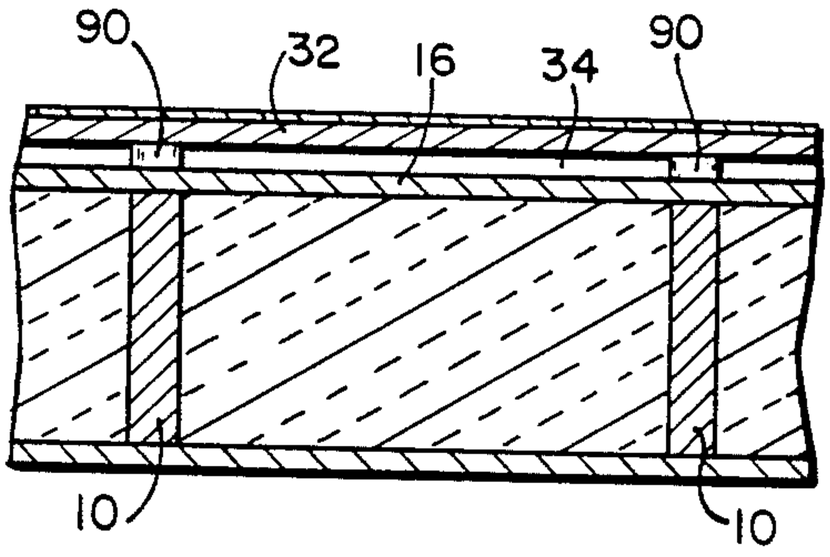



FIG. 9

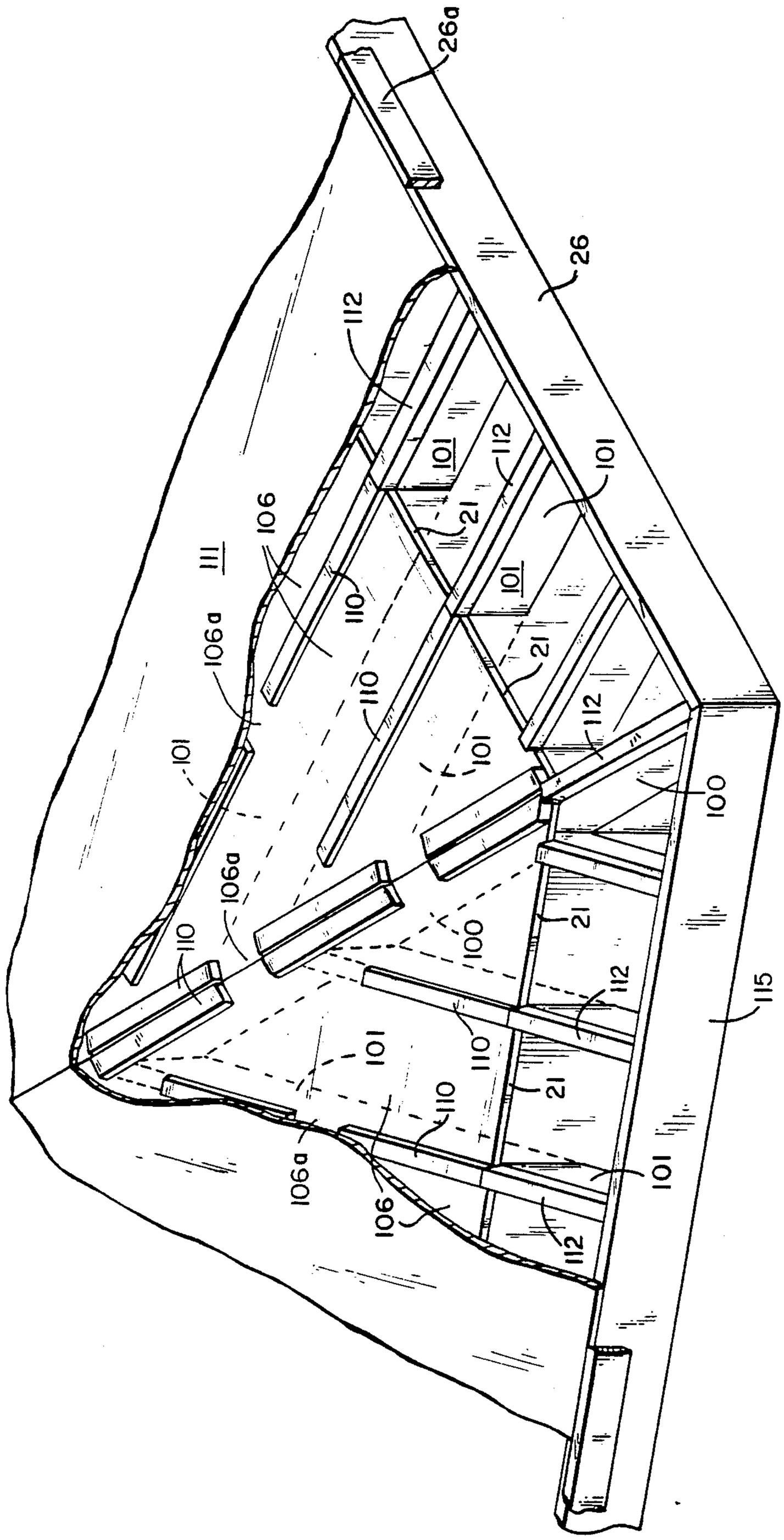



FIG. 10

# VENTED ROOF CONSTRUCTION

This application is a continuation in part of application No. 494,642 filed May 16, 1983, now abandoned.

## BACKGROUND OF THE INVENTION

It is a major problem in cold climates to prevent condensation within the insulated ceiling structure of moisture condensed from the hot, moist inside air within the building. This is particularly true in vaulted interior ceiling constructions where frequently, there is insufficient vented air circulation provided between the insulated portion of the roof structure and the cold outside exposed roofing layer.

The present invention provides a double layer construction with cold vented air circulation passage means between the insulation and the outer roofing layer.

## SUMMARY OF THE INVENTION

This invention consists in the provision of a plurality of air spaces extending inwardly from the outer edges of the roof with venting means at the ends of said passages to provide constant air circulation through the passages to eliminate accumulation of condensed moisture on the outer surface of the insulating layer and thus, prevent water damage within the insulated and finished interior portion of the roof structure.

## DESCRIPTION OF THE DRAWINGS

FIG. **1** is a fragmentary transverse sectional view of a vaulted ceiling roof structure embodying this invention;

FIG. **2** is a sectional view taken substantially along the line **2—2** of FIG. **1**;

FIG. **3** is a transverse sectional view of a house trailer roof design embodying the invention;

FIG. **4** is a vertical sectional view taken substantially along the line **4—4** of FIG. **3**;

FIG. **5** is a horizontal sectional view taken substantially along the line **5—5** of FIG. **6**; and

FIG. **6** is a fragmentary sectional view taken substantially along the line **6—6** of FIG. **5**.

## DETAILED DESCRIPTION

FIGS. **1** and **2** show a vaulted interior ceiling construction embodying the present invention. In the structure shown, gabled rafters **10** are provided in conventional spaced-apart relation to support the roof structure. These are supported at the outside walls by upright stud members **12** which are in turn supported at the bottom ends in a conventional manner on a suitable foundation (not shown). The top ends of the studs are connected by suitable plate members **14** and the rafters **10** are notched and fixed to the plate **14** in the conventional manner. A layer of intermediate sheeting is provided such as the insulation board **16** which is illustrated and which is secured to the outer edges of the rafters as by being nailed thereto in the conventional manner. Insulation material **18** is packed between adjacent rafters and is sealingly enclosed on the outside by the roof sheeting layer **16** and the vertical wall insulation board sheeting layer **20**. The sheets of insulation board **20** forming the wall sheeting layer are notched to tightly surround and engage each rafter and the upper ends of the wall sheeting board **20** are beveled to sealingly engage the bottom surface of the roof insulation board **16** as shown at **21** in FIG. **1**. The rafters **10** extend outwardly beyond the vertical side walls and to form the overhanging eave section **22** to which the soffit board **22***a* is attached. A continuous vent opening **24** is provided adjacent the outer marginal edge portion of the soffit **22***a*. A facia board **26** extends across the outer beveled ends of the rafters **10** as shown and a trim strip **26***a* is provided in the upper portion thereof.



Firring strips **30** overlie the insulation board **16** and in the form shown, are aligned with the rafters **10** as best shown in FIG. **2**. Roof sheeting boards such as the plywood sheets **32** are mounted over the firring strips **30** to form vent passages **34** between the outer sheeting layer **32** and the insulation board layer **16**. These vent passages communicate at their lower ends with the eave vent areas defined between the adjacent joists **10** with the vent openings **24** communicate directly. A layer of conventional roofing material such as the layer of shingles **36** covers the outside sheeting layer **32** in a conventional manner. The upper ends of the passages **34** are vented by means of a ridge vent unit **40** which is fixed in overlying relation to the layer of shingles **36** and sheeting layer **32**, both of which terminate in slightly spaced relation to the apex of the gable ridge as shown to form inner vent openings for the passages **34**.

The inside surface may be finished in a conventional manner such as by drywall plasterboard sheets **42** and a vapor barrier **44** is provided in a conventional manner between the plasterboard and the insulation. This vapor barrier **44** and plasterboard drywall system **42** may also be provided on the inside of the vertical stud walls. Suitable exterior finish may be provided on the vertical side walls such as the siding **46** shown in FIG. **1**.

A modified configuration of the invention is illustrated in FIGS. **3** and **4** which show a generally similar venting construction particularly adapted for mobile homes which normally have a very flat pitch on the roof. In order to produce the vent space necessary to prevent condensation in the insulated roof structure of the mobile home, spaced-apart firring strips **50** are laid over the top of an insulated sheathing layer **51**. These strips **50** run parallel to the roof rafters **52** and preferably overlie the same. A center ridge vent **54** may be provided as disclosed in the first form of the invention shown in FIGS. **1** and **2**, and the ends of the vent passages **56** formed between the firring strips **50** are afforded communication with the ridge vent **54** as described in connection with the previous form of the invention. The outer roof structure includes a layer of plywood sheeting **58** applied over the firring strips **50** to enclose the vent passages **56** and provide support for conventional weatherproof roofing material **60**. The outer eave vents may be formed by sheet metal flashing provided along the outer marginal edges of the roofing and bent downwardly to form continuous flange elements **62** spaced outwardly from the conventional vertical wall structure **65**. A continuous screen may be provided to cover the continuous vent opening **63** formed between the flange **62***a* and the upper corner of the wall.

In FIGS. **5** and **6**, a further modification of the invention is shown. In this modification, communicating vent passages are provided around an obstruction such as the chimney **70** having flues **70***a*. A flat roof structure is shown having the joists **71** supported on studs **72** having a double plate **72***a* on the top thereof. A sealing deck layer **73** is supported on the joists **71** and firring strips **74** are mounted thereon in spaced-apart relation to provide ventilating passages **75** therebetween. The firring strips

overlie the joists **71** to provide the required support therefor. Upper deck sheets such as plywood decking **76** overlie the strips **74** and suitable roofing such as the metal roof **77** is provided. Suitable flashing **78** provides the necessary seal between the chimney masonry and the roof decking **77**. The firring strips **74** terminate in spaced relation to the vertical wall surface of the chimney **70** as best shown in FIG. **5** to provide communication passages **75***a* to complete the ventilating system between the insulated inner roof structure and the outer roof decking **76** and roofing **77**. The inner finished ceiling **79** provided with a sealing barrier **80** of standard construction, is provided and insulation **81** is packed between the joists **71** as shown.

It will be seen that this invention provides a roof construction with a ventilating system between the outer cold air roof structure and the inner insulated roof structure which will positively prevent the accumulation of moisture which may condense on the outer surface of the insulated inner roof structure.

FIGS. **7**, **8** and **9** disclose another modification of this invention in which the upper roof vent has been eliminated. It has been found that sufficient circulation of outside air can be produced by providing direct communication between adjacent vent spaces to permit the outside air to flow freely under the entire roof surface and maintain the entire roof surface at substantially the same temperature as the outside air and thus, avoid the ice build-up caused by melting of the snow on the roof and subsequent freezing thereof as the water runs down under the snow even in below freezing temperatures.

The ridge vent construction previously disclosed herein frequently permits snow to blow into the vent air space and thus, provide a source of water which can reach the interior roof structure and cause damage to the interior finished ceiling and in addition, has created other problems such as the unsightly appearance at the peak of the roof. For these reasons, it is desirable to eliminate this ridge vent or other vents on the roof surface, since sufficient circulation throughout the entire air space has been produced to solve the freezing problem described herein.

Referring to FIGS. **7**, **8** and **9**, similar reference numerals have been applied to the various roof components as those disclosed in FIGS. **1** and **2**, wherein rafters **10** are illustrated along with wall stud members **12** having suitable plate members **14** mounted on top thereof and wall sheeting board **20**. Insulation material **18** is packed between the rafters and is sealingly enclosed by the roof sheeting layer **16** which is joined with the vertical wall sheeting board **20** at **21** as previously described. Overhanging eaves **22** are provided with an outer soffit board **22***a* and a facia board **26** with a trim strip **26***a* attached at the outer ends of the rafters **10**. A continuous vent opening **24** is provided along the outer edge of the soffit **22***a*.

In this form of the invention (shown in FIGS. **7–9**) spacer-firring strips **90** are installed over the sheeting board **20** in registration above the rafters **10** as illustrated. These spacer-firring strips extend from the outer building wall surface above the juncture of the roof and wall insulation board at **21** to an elevation spaced downwardly from the ridge of the roof designated by the numeral **91**, thus providing a cross ventilation passages **92** between the adjacent ventilation passages **34** formed by the strips **90**. Outer sheeting such as the plywood layer **32** overlies the strips **90** in the same manner previously described in connection with FIGS. **1** and **2**, except for the cross communication passages **92** between adjacent passages **34**. These strips **90** provide a supporting structure for the conventional roof shingles **36** as illustrated.

Another detailed modification of the invention which embodies many of the concepts of the form shown in FIGS. **7**, **8** and **9**, is illustrated in FIG. **10**, which shows a conventional hip roof construction. In this form of the invention, a hip rafter **100** is illustrated with a plurality of jack rafters **101** extending downwardly therefrom. Insulation is packed in the space defined by the hip rafters and the respective jack rafters **101** in the conventional way, and suitable insulation board **105** is provided to seal the insulation compartments.

Air vent spaces **106** are defined above the insulation board **105** by the spacer/firring strips **110** which are applied over the rafters **100** and **101**. Suitable decking, such as the plywood decking **111**, is laid over the spacer strips **110** to enclose the vent spaces **106** and conventional roofing (not shown) in FIG. **10** is applied to the plywood decking **111**. The rafters **101** are notched into the plate members **14** at the top of the wall and extend outwardly beyond the wall to support the eave structure as illustrated.

A facia board **26** and a facia board **26***a* are shown at the outer edge of the eaves and are supported by the ends of the rafters **100** and **101**. Eave firring strips **112** extend out to the facia board and overlie the rafters **100** and **101** as indicated. The firring strips **110** overlying the jack rafters **101** terminate in spaced relation providing cross passages **106***a* which the hip rafter **100** to permit air flow between adjacent spaces **106** at the upper ends thereof so that each of the vent spaces **106** are in communication with the adjacent vent space **106**, so that a complete communication between all the vent spaces **106** is permitted through cross passages **106***a* in the same manner as is illustrated in FIGS. **7**, **8** and **9**.

Suitable vent openings **24** are provided along the outer marginal edge portion of the soffit as shown in fragmentary sectional view **11**, so that outside air is free to pass up into the vent spaces **106** and from one vent space **106** to the next through cross passages **106***a* as previously described. This maintains the roof surface at approximately the same temperature as the outside air without necessitating a ridge vent construction or other venting means at the upper ends of the passages. The communication at the upper ends of the vent spaces has proved to provide sufficient circulation to maintain this outside air temperature condition.

The construction illustrated represents a hip roof condition. However the same general construction details would be present in a roof valley condition, so that the communicating vent spaces would prevent ice build-up from forming in the valleys.

What is claimed is:

**1**. A vented roof construction including,

an insulated inner roof structure,

an intermediate layer sealingly covering the insulated inner roof structure,

an outer roof sheeting layer spaced outwardly from the intermediate layer and providing vent passage means therebetween,

venting means at the two ends of said passage means to provide vented areas at the ends of the passage means and produce circulation therethrough and remove condensation from the top surface of the intermediate layer,

spacing and supporting means interposed between said two layers to provide support for the outer roof sheeting layer while maintaining the vent passage means therebetween,

wherein said spacing means comprises a plurality of spaced-apart firring strips extending between the proximate end portions of said layers and defining individual passages and said venting means communicating with the ends of said individual passages,

and said firring strips terminating in spaced relation to the ends of said passages providing cross passages to afford communication between adjacent passages, said venting means communicating with the cross passages to eliminate dead air space from the roof structure.

2. The structure set forth in claim 1 wherein said insulated inner roof structure includes a plurality of spaced-apart parallel structural members extending substantially from one vented area of the roof to the other vented area thereof wherein said spacing firring strips generally overlie in registration with said structural members to provide support for the outer roof sheeting layer while defining said vent passage means.

3. The structure set forth in claim 1 wherein the intermediate layer comprises insulating board material to provide the desired sealed covering as well as additional insulation to the inner roof structure.

4. A roof construction having a vented air space therein and including,

an insulated inner roof structure,

an intermediate sealing layer sealingly covering the insulated roof structure,

an outer roof sheeting layer spaced outwardly from the intermediate layer and providing vent passages between said two layers, and

venting means only at the lower ends of said passage means to provide outside air flow into said passage means only from said lower passage ends and cross ventilation spaces between adjacent vent passages to provide circulation through said vent passages and maintain the temperature of the outer roof structure at substantially the same temperature as the outside ambient air.

5. The structure set forth in claim 4 and spacing and supporting means interposed between said two layers to provide support for the outer roof sheeting layer while maintaining the vent passage means therebetween.

6. The structure set forth in claim 4 wherein said spacing means comprises a plurality of spaced-apart firring strips extending between the proximate end portions of said layers and defining individual passages and said venting means communicating with the ends of said individual passages.

7. The structure set forth in claim 6 wherein said insulated inner roof structure includes a plurality of spaced-apart parallel structural members extending substantially from one vented area of the roof to the other vented area thereof wherein said spacing firring strips generally overlie in registration with said structural members to provide support for the outer roof sheeting layer while defining said vent passage means.

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